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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/683,929	03/04/2002	Christopher K. Magg	BUR920010052	3808
29505	7590	12/02/2003	EXAMINER	
DELIO & PETERSON, LLC 121 WHITNEY AVENUE NEW HAVEN, CT 06510			SAGAR, KRIPA	
			ART UNIT	PAPER NUMBER
			1756	
DATE MAILED: 12/02/2003				3

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/683,929

Applicant(s)

MAGG, CHRISTOPHER K.

Examiner

Kripa Sagar

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other:

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DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Pat.6472107 to Chan in view of US Pat.5948570 to Kornbilt et al.

The claims recite the intermediate structure of a photomask and method of making of the photomask: comprising an opaque layer (Cr or Cr:O:N) on a transparent substrate (quartz) and a hard mask (W) for patterning the opaque layer with a photoresist.

Chan's invention differs from the instant claims in that the mask structure has an anti reflective coating (ARC) between the opaque layer and the metal layer. The method of making the mask is similar to the instant process (3;63-6;14). A transparent quartz substrate is coated in order with Cr, an ARC of CrO and a hard mask metal (Fig.5). The blank is coated with a photoresist [cl. 1-4, 8,] and patterned (Fig.6). The pattern is transferred to the metal layer without etching the ARC or Cr (Fig.7) and in the next stage a second etch transfers the pattern to the underlying layers [cl.13,20] (Fig.8). The resist and hard mask (Fig.9) are removed [cl.14]. The Cr-layer is typically 900-1000

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Ang. [cl.9,15]. The hard mask may be W [cl.4-6, 10,11,16,18] coated to a thickness of 50-500 Ang. (3;63-4;13). Chan teaches most of the elements of claims 1-6, 8-11,13-16,18,20. The use of ARCs is routine in the art and is incidental to the process; it does not detract from the obvious similarities of the instant claims. It does not teach the thickness of the resist layers [cl.7,12,17,19].

Kornbilt teaches that the resist layer thickness[cl.7,17,19] of a similar process is in the range of 200-500 mu.m. (5;38-42). Film thickness depends on the nature of the resist used and it is conventional in the art to routinely optimize the coating to the application at hand.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to coat the resist to an optimum thickness, based on the material and exposure parameters used -- the range suggested by Kornbilt would assure success in forming Chan's mask using similar resist and exposure methods .

3. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kornbilt in view of Chan.

Referring to Figs.4,5 Kornbilt teaches a transparent substrate[20], an opaque layer [51] and a metal layer [55]. Most of the elements of cl.1,8 are thus obvious in view of Kornbilt. An additional hard-mask layer [41/52] is used for photopatterning (4;56-5;28) the metal layer. Thus the photoresist does not "directly contact" the metal layer. Kornbilt teaches that the top Cr-layer is a hard mask layer. It also teaches that organo-metallic photoresists may be used without the hard mask to provide direct etching of metal (2; 11-56). It is within the ordinary skill level of an artisan to eliminate the top Cr-

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layer as a hardmask and to pattern the metal layer directly; this would be an obvious reduction in process steps. Kornbilt teaches the instant substrate materials[cl.2] (3;11-22, 40-43 & 5;20-22). The opaque layer may be a Cr-compound [cl.3] (5;24-29). A W-metal layer [cl.4] has been discussed above. The photopatterning steps [cl.13] are conventional and discussed with respect to the first and second embodiments (3;40-5;28). The etchants are selectively used [cl.20] to etch either Cr or W to form vertical sidewalls (6;4-8). Kornbilt teaches that the resist layer thickness[cl.7,12,17,19] of a similar process is in the range of 200-500 μm . (5;38-42). Film thickness depends on the nature of the resist used and it is conventional in the art to routinely optimize the coating to the application at hand.

Kornbilt's metal and Cr layer thickness differ from those of the instant claims [cl. 5,6,9-11,15,16,18]. It does not teach removal of the top metal layer [cl.14].

Chan's method of making the mask is similar to Kornbilt's and the instant process (3;63-6;14). A transparent quartz substrate is coated in order with Cr, an ARC of CrO and a hard mask metal (Fig.5). The blank is coated with a photoresist and patterned (Fig.6). The pattern is transferred to the metal layer without etching the ARC or Cr (Fig.7) and in the next stage a second etch transfers the pattern to the underlying layers (Fig.8). The resist and hard mask (Fig.9) are removed [cl.14]. The Cr-layer is typically 900-1000 Ang. [cl.9,15]. The hard mask may be W [cl.4-6, 10,11,16,18] coated to a thickness 50-500 Ang. (3;63-4;13).

A skilled artisan, at the time the invention was made would have readily realized the instant invention by adjusting the metal and Cr thickness values as suggested by

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Chan in Kornbilt's process. The motivation for this arises from the fact that these values are conventional and known in the art (Chan: 1;42-44); these tried and typical ranges (Chan:3;63-4;13) provide a reasonable expectation of success in forming the mask with superior control of the critical dimensions (Chan:5;59-64). The small range of metal thickness also suits its function as an anti-reflective coating (Chan:5;47-54).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 703-605-4427. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 703-308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

MH/ks



MARK F. HUFF
SUPERVISORY PATENT EXAMINER
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